IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Song
Serial No.:	10/770,893
Filed:	February 3, 2004
Group Art Unit:	1793
Examiner:	Christopher S. Kessler
Title:	CASTABLE HIGH TEMPERATURE ALUMINUM ALLOY

Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

APPEAL BRIEF

Dear Sir:

Appellant now submits this Appeal Brief subsequent to the filing of the Notice of Appeal. Fees in the amount of $540.00 may be charged to Deposit Account Number 21-0279 in the name of United Technologies Corporation.

Additionally, the PTO apparently issued a Notice of Panel Decision on July 30, 2009 from Appellant's Pre-Appeal Brief Review. Appellant did not receive this Notice but desires to continue this application and appeal. Examiner Kessler called Appellant's representative on March 2, 2010. Examiner Kessler has either not abandoned this case or has withdrawn the apparent abandonment due to Appellant's non-receipt of the Notice. Applicant believes that fees in the amount of $2350.00 for a 5 month extension are necessary; however, the Commissioner is authorized to charge Deposit Account No. 50-1482 in the name of Carlson, Gaskey & Olds for any additional fees or credit the account for any overpayment.

In the alternative that this application is considered to be abandoned, this paper should be considered a Petition to Revive an unintentionally abandoned application under 37 CFR 1.137(b) and the fee in the amount of $1620 may be charged to the Deposit Account No. 50-1482 in the name of Carlson, Gaskey & Olds. The entire delay in filing the required reply from the due date for the required reply until the filing of a grantable petition was unintentional.

Real Party in Interest

The real party in interest is United Technologies Corporation, assignee of the present invention.

Related Appeals and Interferences

Co-owned application 11/231,479, now U.S. Patent No. 7,584,778, entitled "METHOD OF PRODUCING A CASTIBLE HIGH TEMPERATURE ALUMINUM ALLOY BY CONTROLLED SOLIDIFICATION" was previously appealed and resulted in the Board issuing a Decision on Appeal on March 25, 2009. Additionally, the present application was previously appealed on June 30, 2009 but was withdrawn prior to a decision.

Status of Claims

Claims 17-25 were previously cancelled. Claims 1-16 and 26-29 stand rejected and are appealed.

Status of Amendments

Applicant's proposed Amendment After Final that was filed on June 2, 2009 was not entered (see Advisory Action June 4, 2009).

Summary of Claimed Subject Matter

The application generally relates to an alloy for use in high temperature environments. The alloy retains strength at elevated temperatures and can be produced using conventional types of casting techniques.

The application includes four independent claims (claims 1, 6, 9, and 10), which are summarized as follows.

Independent claim 1 is directed to an aluminum alloy composition including 1.0wt% to 20.0wt% of a first rare earth element selected from a group consisting of ytterbium and gadolinium [see Specification page 4, paragraph 21, lines 1-5; page 6, paragraph 30, lines 1-3], a plurality of insoluble particles formed of the first rare earth element [page 4-5, paragraph 22, lines 5-12; page 8, paragraph 36, lines 1-6], and approximately 0.1wt% to 10.0wt% of at least one second rare earth element selected from the group consisting of gadolinium, erbium, and yttrium if the first

rare earth element is ytterbium [page 4, paragraph 22, lines 1-5] or the group consisting of ytterbium, erbium, and yttrium if the first rare earth element is gadolinium [page 7, paragraph 32, lines 1-6]. The combined weight of the first rare earth element and the at least one second rare earth element is greater than 10.0wt% [page 5, paragraph 23, lines 1-3; page 7, paragraph 33, lines 1-3]. The aluminum alloy composition also includes at least one minor alloy element comprising copper, zinc, silver, magnesium, tin, titanium, cobalt, or calcium [page 5, paragraph 24, lines 1-8; page 7, paragraph 34, lines 1-6], with a balance of the alloy being aluminum.

Independent claim 6 is similar to claim 1 but recites a narrower composition that includes approximately 14.0wt% to 15wt% of ytterbium as the first rare earth element and approximately 4.0wt% of yttrium as the at least one second rare earth element [page 5, paragraph 23, lines 1-3].

Independent claim 9 is also similar to claim 1 but recites a narrower composition that includes approximately 13.0wt% to 16.0% of gadolinium as the first rare earth element and approximately 4.0wt% of yttrium as the at least one rare earth element [page 7, paragraph 33, lines 1-3].

Independent claim 10 is also similar to claim 1 but claims the aluminum alloy composition in the form of a gas turbine engine component [page 4, paragraph 21, lines 1-2; page 6-7, paragraph 30, lines 1-9; page 11, paragraph 45, lines 6-9].

Grounds of Rejection to be Reviewed on Appeal

I. Claims 1-4, 10-13, and 26-29 were improperly rejected under 35 U.S.C. §103(a) as being unpatentable over Watson.

II. Claims 1-5, 7, 8, 10-16, and 27-29 were improperly rejected under 35 U.S.C. §103(a) as being unpatentable over Higashi.

III. Claims 1-3, 7-12, 15, 16, 26, and 27 were improperly rejected under 35 U.S.C. §103(a) as being unpatentable over EP 750911 (hereafter "EP 911").

IV. Claims 5 and 6 were improperly rejected under 35 U.S.C. §103(a) as being unpatentable over Watson in view of Higashi.

Arguments

I. Rejection of claims 1-4, 10-13 and 26-29 under §103(a) over Watson.

The Watson reference does not disclose an aluminum alloy composition that is identical to the claimed composition. The Examiner asserts that Watson discloses the chemical elements of the claimed composition and that Watson suggests that certain chemical elements are equivalents that can be substituted for other chemical elements to achieve the claimed composition. Appellant disagrees because Watson does not suggest that the chemical elements are equivalents as the Examiner contends.

In general, Watson discloses an aluminum alloy having dispersed particles for strength. The particles are a compound of aluminum and alloying elements, referred to in Watson as a $L1_2$ forming elements.

The Examiner asserts that Watson discloses a preferred composition having scandium as an $L1_2$ forming element and that scandium, erbium, and ytterbium are equivalent elements because Watson lists each of scandium, erbium, and ytterbium as $L1_2$ forming elements.

Indeed, a reference may be relied upon for all that it would have reasonably suggested to one of ordinary skill in the art, including non-preferred embodiments. A reference disclosing optional inclusion of a particular component teaches compositions that both do and do not contain that component. However, this is not the case in Watson. The Examiner relies on isolated portions of Watson, taken out of context, to support the proposition that scandium is merely a preferred embodiment. The Watson reference taken as a whole does not support such an interpretation.

The outset of the detailed description of Watson (col. 2, lines 7-11) states that the "present invention" of Watson is based on the broad alloy composition having 3-16 wt. % of scandium and the problem addressed relates to the dispersion of Al_3Sc particles in this alloy (col. 2, line 31). Thus, the Examiner points to isolated portions of Watson which, out of context, might seem to support the Examiner's interpretation. However, Watson as a whole is explicitly limited to alloys that include scandium. The example alloys (beginning col. 4, line 5) each include scandium and therefore further support that the disclosure of Watson is limited to a broad alloy composition that includes scandium. Thus, the use of scandium is required in Watson, not an option or mere preferred embodiment. Watson does not therefore suggest that erbium, ytterbium and scandium are equivalents that can be freely substituted for one another. For these reasons, the rejection is improper and must be reversed.

II. Rejection of Claims 1-5, 7, 8, 10-16, and 27-29 under §103(a) over Higashi.

The Examiner asserts that the composition of the Higashi reference having up to 10wt% of rare earth elements is close enough to the claimed composition of greater than 10wt% that one of ordinary skill in the art would have expected these ranges to have the same properties. The Examiner relies on *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985) to establish obviousness of close ranges.

Appellant disagrees with the Examiner's conclusion and reliance on *Titanium Metals Corp.* because Higashi teaches away from using an amount of rare earth elements that is greater than 10wt%. In *Titanium Metals*, there was no evidence establishing that the close ranges were not equivalent. In absence of such evidence, the Court concluded that the ranges were equal. Unlike *Titanium Metals*, there is evidence in the present application that the ranges are not equivalent. Higashi teaches away from using an amount of rare earth element that is greater than 10wt% (col. 2, lines 46-47). Using an amount greater than 10% (col. 2, lines 46-47) would not provide the same properties because the amount influences the crystallization and the strength of the alloy (col. 2, lines 46-50). Therefore, the amount over 10% is not merely "wasted" as the Examiner suggests but instead functions to debit the alloy and would therefore not be equivalent to using an amount that is less than 10%. Accordingly, the rejection is improper and must be reversed.

III. Rejection of Claims 1-3, 7-12, 15, 16, 26, and 27 under §103(a) over EP 911.

The Examiner asserts that the claimed minor alloy elements are inherently included as impurities in the composition of EP '911. In further support, the Examiner points to "Aluminum and Aluminum Alloys," page 639, which lists various elements that may be found as impurities in aluminum alloys. The Examiner further asserts that Appellant has offered no evidence that the inevitable impurities of aluminum alloys are not "minor elements." However, the burden is on the Examiner to establish *prima facie* obviousness and that the claimed "at least one minor alloy element" comprising copper, zinc, silver, magnesium, tin, titanium, cobalt or calcium" would necessarily be present in the prior art.

The fact that a certain result or characteristic may occur or be present is not sufficient to establish the inherency. To establish inherency, the evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. The Examiner must show more than a probability or mere possibility, i.e., the Examiner must show that the claimed elements are inevitably or invariably always in aluminum alloys. See MPEP 2112 IV.

The "ASM Specialty Handbook, Properties of Pure Aluminum" that the Examiner points to merely lists possible impurity elements and does not explicitly state that all the listed elements would be necessarily be present in an aluminum alloy. Further, since the elements are impurities, one could not pick and choose which elements are present. Accordingly, the rejection is improper and must be reversed.

IV. Rejection of claims 5 and 6 under 35 U.S.C. §103(a) over Watson in view of Higashi.

As pointed out above under section I, the Watson reference does not suggest that erbium, ytterbium and scandium are equivalents that could be freely substituted for one another. Therefore, adding the teachings of Higashi does not resolve the noted issues with regard to Watson and the rejection must be reversed.

Closing

For the reasons set forth above, the final rejection of claims 1-16 and 26-29 is improper and must be reversed.

Respectfully submitted,

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Dated: March 5, 2010

CLAIMS APPENDIX

1. An aluminum alloy comprising:

approximately 1.0 to 20.0% by weight of a first rare earth element selected from the group consisting of ytterbium and gadolinium;

a plurality of insoluble particles formed of said first rare earth element;

approximately 0.1 to 10.0% by weight of at least one second rare earth element selected from the group consisting of gadolinium, erbium and yttrium if said first rare earth element is ytterbium or the group consisting of ytterbium, erbium and yttrium if said first rare earth element is gadolinium, wherein a combined weight of the first rare earth element and the at least one second rare earth element is greater than 10.0% by weight; and

at least one minor alloy element comprising copper, zinc, silver, magnesium, tin, titanium, cobalt or calcium, wherein a balance of the aluminum alloy is aluminum.

2. The aluminum alloy as recited in claim 1 further including approximately 1.0 to 15% total by weight of the at least one minor alloy element.

3. The aluminum alloy as recited in claim 1 wherein said at least one minor alloy element comprises magnesium.

4. The aluminum alloy as recited in claim 1 wherein said first rare earth element is ytterbium and said plurality of insoluble particles are formed of said ytterbium

5. The aluminum alloy as recited in claim 4 wherein said at least one second rare earth element is said yttrium.

6. An aluminum alloy comprising:

approximately 14.0% to 15% by weight of a first rare earth element consisting of ytterbium;

a plurality of insoluble particles formed of said first rare earth element; and

approximately 4.0% by weight of at least one second rare earth element consisting of yttrium, wherein a balance of the aluminum alloy is aluminum.

7. The aluminum alloy as recited in claim 1 wherein said first rare earth element is gadolinium and said plurality of insoluble particles are formed of said gadolinium

8. The aluminum alloy as recited in claim 7 wherein said at least one second rare earth element is said yttrium.

9. An aluminum alloy comprising:

approximately 13.0 to 16.0% by weight of at least one first rare earth element consisting of gadolinium;

a plurality of insoluble particles formed of said first rare earth element; and

approximately 4.0% by weight of at least one second rare earth element consisting of yttrium, wherein a balance of the aluminum alloy is aluminum.

10. A gas turbine engine component comprising:

components of an aluminum alloy including approximately 1.0 to 20.0% of a first rare earth element selected from the group consisting of gadolinium and ytterbium, a plurality of insoluble particles formed of said first rare earth element, approximately 0.1 to 10.0% by weight of at least one second rare earth element selected from the group consisting of gadolinium, erbium and yttrium if said first rare earth element is ytterbium or the group consisting of ytterbium, erbium and yttrium if said first rare earth element is gadolinium, and at least one minor alloy element comprising copper, zinc, silver, magnesium, tin, titanium, cobalt or calcium, wherein a combined weight of the first rare earth element and the at least one second rare earth element is greater than 10.0% by weight and a balance of the aluminum alloy is aluminum.

11. The gas turbine engine component as recited in claim 10 further including approximately 1.0 to 15% total by weight of at least one minor alloy element.

12. The gas turbine engine component as recited in claim 11 wherein said at least one minor alloy element is selected from the group consisting of copper, zinc, silver, magnesium, manganese, tin, titanium, cobalt and calcium.

13. The gas turbine engine component as recited in claim 10 wherein said first rare earth element is ytterbium and said plurality of insoluble particles are formed of said ytterbium

14. The gas turbine engine component as recited in claim 13 wherein said at least one second rare earth element is yttrium.

15. The gas turbine engine component as recited in claim 10 wherein said first rare earth element is gadolinium and said plurality of insoluble particles are formed of said gadolinium.

16. The gas turbine engine component as recited in claim 15 wherein said at least one second rare earth element is yttrium.

26. The aluminum alloy as recited in claim 1, wherein the combined weight of the first rare earth element and the at least one second rare earth element is greater than 11.0% by weight.

27. The aluminum alloy as recited in claim 1, consisting essentially of the first rare earth element, the at least one second rare earth element, the at least one minor alloy element, and the aluminum.

28. The aluminum alloy as recited in claim 1, comprising approximately 0.1% to 6% by individual weight of at least two of the minor elements.

29. The aluminum alloy as recited in claim 28, wherein a combined amount of the minor alloy elements is approximately 1% to 15% by weight.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

Copy of Decision on Appeal from application 11/231,479, Appeal 2009-1629

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/231,479	09/21/2005	Shihong Gary Song	67097-424	7536

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SHIHONG GARY SONG,
and RAYMOND C. BENN

Appeal 2009-1629
Application 11/231,479
Technology Center 1700

Decided:[1] March 25, 2009

Before BEVERLY A. FRANKLIN, MARK NAGUMO, and
KAREN M. HASTINGS, *Administrative Patent Judges*.

FRANKLIN, *Administrative Patent Judge*.

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the Decided Date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants seek our review under 35 U.S.C. § 134 of the final rejection of claims 1-33. We have jurisdiction under 35 U.S.C. § 6(b) (2002).

Claims 1, 9, 10, 11, and 26 are representative of the subject matter on appeal and are set forth below:

1. A method of casting an aluminum alloy, the method comprising the steps of:

forming the aluminum alloy including aluminum, at least one rare earth element selected from the group consisting of ytterbium, gadolinium, yttrium, erbium and cerium, and at least one minor alloy element selected from the group consisting of copper, nickel, zinc, silver, magnesium, strontium, manganese, tin, calcium, cobalt and titanium;

controlling solidification of the aluminum alloy in a quenchant.

9. The method as recited in claim 1 further including the steps of determining an optimal composition of the aluminum alloy and controlling a solidification rate of the aluminum alloy.

10. The method as recited in claim 1 further including the step of heating the quenchant to approximately 100 °C.

11. The method as recited in claim 1 wherein the quenchant comprises water and a water soluble material.

26. The method as recited in claim 1 wherein the step of controlling solidification of the aluminum alloy forms a primary eutectic microstructure and a second eutectic microstructure.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Song ('774)	US 6,622,774 B2	Sep. 23, 2003
Song ('893)	10/770,893	Feb. 3, 2004[2]
Song ('739)	2004/0156739 A1[3]	Aug. 12, 2004

SUMMARY OF THE DECISION

We affirm.

THE REJECTIONS

I. Claims 1-33 are rejected under 35 U.S.C. 103(a) over Song '739 in view of Song '774.

II. Claims 1-33 are provisionally rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 17-25 of Song '893 in view of Song '774.

ISSUE

I. Have Appellants shown reversible error in the Examiner's rejection because the use of the controlled solidification process taught by Song '774 in the process taught by Song '739 would destroy the intended function of the products made by Song '739, and thus there is no motivation to combine the references?

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[2] This is the filing date of the application.

[3] This is the publication of application S.N. 10/770,893. On page 3 of the Answer, the Examiner lists both the patent publication as well the corresponding application. This is proper, because Song '739 is prior art under § 102(b), while Song '893 is the basis of the provisional obviousness type double patenting rejection.

2. With regard to claims 26-32, have Appellants shown reversible error in the Examiner's rejection by evincing that the combination of Song' 774 in view of Song '739 does not suggest that the controlled solidification of the alloy forms a primary and second or secondary eutectic microstructure as recited in these claims?

3. Have Appellants shown reversible error in the Examiner's determination that Appellants' claimed invention is obvious over claims 17-25 of copending Application No. 10/770,893 (Song '893) in view of Song '774 on the ground of nonstatutory obviousness-type double patenting (provisional rejection)?

FINDINGS OF FACT

Song '739 is directed to an aluminum alloy suitable for making parts such as for gas turbine engines (parts for elevated temperature applications). The rare earth elements and minor alloy elements, and amounts thereof, which are included in the alloy of Appellants' claims are taught by Song '739. Appellants do not argue these aspects of their claimed invention and do not dispute the teachings of Song '739 in this regard.

Song '739 teaches, in paragraph [0045], that various casting methods can be used to form a desired part. These methods include sand casting, investment casting, and die casting.

In particular, in paragraph [0046] of Song '739, Song '739 teaches that investment casting can be utilized for engine housing manufacturing, allowing for more design flexibility. Song '739 teaches that investment casting is beneficial for making engine parts having a complex geometry, allowing parts to be cast with greater precision and complexity. Song '739

teaches that investment casting can be expensive because of the use of tooling and the process of shell molds.

Song '739 teaches, for example, that die casting is advantageous as it allows for relatively fast cooling and high production rates [0047]. Appellants do not dispute the Examiner findings that cooling rates of sand casting and investment casting processes are slower than the cooling rate of a die casting process. Nor do Appellants dispute the Examiner's finding that the cooling rate determines the as-cast microstructure.

Paragraph [0048] of Song '739 teaches that for engine applications the aluminum alloy is cast without post-casting solution and aging treatments, and that these treatments are heat treatment processes that are optional.

Song '739, in paragraph [0049], teaches that conventional cooling rates for many conventional casting methods range from 10 to 100 °K/sec (which converts [1 K = 1° C] to 600 to 6000°C /min).

Song '774 discloses an investment casting process which utilizes rapid cooling by immersing the shell mold into a quenching oil bath. According to Song '774, the rapid solidification achieves a uniform fine microstructure in the as-cast component (Abstract), while slow solidification produces a coarse and heterogeneous casting microstructure (col. 1, l. 18-19).

In the process of Song '774, the mold is lowered at a predetermined immersion rate to produce a desired final microstructure for the as-cast component (col. 4, l. 1-3). Song '774 does not specify a particular cooling rate, but teaches that the cooling rate can be specifically tailored to various component types/shapes by controlling/varying the immersion rate of the shell mold into the bath (col. 1, l. 58-64). Cooling rate is also a function of the thickness and permeability of the shell mold.

PRINCIPLES OF LAW

"Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1740-41 (2007). "To facilitate review, this analysis should be made explicit." Id. "[T]he analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *Id.*

That which is inherent in the prior art, if not known at the time of the invention, cannot form a proper basis for rejecting the claimed invention as obvious under § 103. *See In re Shetty*, 566 F.2d 81, 86 (CCPA 1977).

A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Peterson*, 315 F.3d 1325, 1330 (Fed. Cir. 2003) ("The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.").

An examiner will balance the suggestive power of the conflicting prior art, taking into account the degree to which one reference might fairly discredit the other. See *In re Young*, 927 F.2d 588, 591 (Fed. Cir. 1991).

ANALYSIS

I. The § 103 Rejection of Claims 1-33

A. Claims 1-8, 12-20, 22, 24, 25, and 33[4]

The Examiner has given sufficient reason for combining the references according to *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727 (2007). The Examiner explains how Song '739 teaches that investment casting can be used in forming a desired aluminum alloy part according to the invention of Song '739. Song '774 provides such a process [investment casting] which utilizes rapid cooling by immersing the shell mold into a quenching oil bath. On pages 6-7 of the Answer, the Examiner states that it would have been obvious to have utilized the solidification process of Song '774 in making the an aluminum alloy part of Song '739 "to better control the solidification process and to speed up the cooling rate and thereby to speed up the production rate and to obtain a uniform fine microstructure in the as-cast component."

Appellants attempt to show that the proposed modification would render the Song '739 inoperable for its intended purpose, but Appellants' arguments are not convincing in this regard. Appellants' assertion that the resulting microstructure of the aluminum alloy part would be altered, which "could" have negative effects on the properties of the aluminum alloy, and that such properties would be unknown, is not supported by credible

[4] We group these claims together because Appellants set forth similar arguments for these claims (Br. 16, 17, 19, 20, and 21).

evidence. While Appellants do point to one process parameter as described in paragraph [0048] of Song '739 regarding heat treatments in an effort to show that such heat treatments would have to be eliminated if the process of Song '774 were employed, the Examiner correctly points out that these heat treatments are indicated as optional in Song '739.

Hence, absent some objective evidence in support of the proposition that the proposed modification would destroy the intended function of Song '739, we are not convinced by Appellants' arguments.

On page 2 of the Reply Brief, although belated, Appellants also argue that if the casting process of Song '774 was employed, the parts "that are required to be made by die casting and sand casting could not be made, going against the specific disclosure of Song '739." This is unconvincing in view of the fact that Song '739 specifically teaches that investment casting can be employed.

Also on page 2 of the Reply Brief, although belated, Appellants argue that the solidification rate of an aluminum alloy affects the resulting microstructure and properties of the aluminum alloy. Appellants argue that if the solidification rate of the aluminum alloy of Song '739 was controlled during casting, the solidification rate would change the resulting microstructure and properties of the alloy of Song '739. This is unconvincing because Song '739 recognizes that the use of different casting methods affects the resultant properties of the alloy. Furthermore, Song '739, in paragraph [0049], teaches a cooling rate of from 10 to 100 °K/sec (which converts to 600 to 6000 °C/min). Song '739 teaches that this rate is typical of many conventional casting methods. Song '774 does not specify a particular cooling rate, but, as pointed out by the Examiner on page 6 of the

Answer, Song '774 teaches that the cooling rate can be tailored to various types/shapes, and is controlled by varying the type of quenchant or by varying the temperature of the quenchant. Cooling rate is also a function of the thickness and permeability of the shell mold. Appellants have not shown that the cooling rate in Song '739 conflicts with the teachings in Song '774 such that one skilled in the art would have been dissuaded from employing the investment casting method of Song '774 in making the aluminum alloy part of Song '739.

Therefore, we conclude that Appellants have not shown reversible error in the Examiner's rejection of claims 1-8, 12-20, 22, 24, 25, and 33 as obvious over Song '739 in view of Song '774.

B. Claim 9

Claim 9 is dependent upon claim 1 and recites, inter alia, the step of determining an optimal composition of the aluminum alloy. Appellants argue that neither of the references teaches such a step. We are in agreement with the Examiner's position as set forth on page 8 of the Answer that because the phrase "optimal composition" is arbitrarily defined, the composition in Song '739 is considered an optimal composition. Moreover, optimization is an ordinary aspect of any preparative process. Accordingly, Appellants have not shown reversible error in the Examiner's determination that "optimization," as claimed broadly, would have been obvious.

C. Claims 10 and 21

These claims recite that the quenchant is heated to approximately 100°C. We are in agreement with the Examiner's position as set forth on

page 8 of the Answer that Song '774 teaches that the cooling rate can be controlled by varying the temperature of the quenchant, and therefore it would have been obvious to have selected a particular quenchant temperature through routine experimentation. In the instance case, the prior art recognizes the result effective capability of a particular invention parameter. Therefore, an expectation exists that optimizing a parameter would successfully yield a desired result. *Peterson*, 315 F.3d at 1330.

D. Claims 11 and 23

Claims 11 and 23 are directed to a quenchant comprising water and a water soluble material. As discussed by the Examiner on page 9 of the Answer, the Examiner stated in the Final Office Action date January 18, 2007 that it is conventional to add an additive such as glycols to cooling water to facilitate the cooling function thereof, and therefore it would have been obvious to use a water-glycol mixture in the process of Song '774 to obtain the optimal evaporative property. In this Final Office Action, the Examiner referred to U.S. Patent Number 6,135,199 in support thereof. (Final Office Action, page 4). The Examiner states that Appellants did not dispute this statement until the filing of the Appeal Brief.[5]

In view of this prosecution history, the Examiner in effect has taken official notice, with documentary evidence, of the fact that it is conventional to add an additive to cooling water to facilitate the cooling function thereof.

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[5] On page 4 of the Nonfinal Office Action mailed August 11, 2006, the Examiner also referred to U.S. Patent Number 6,135,199 in support of his statement that "it is conventional to add an additive to cooling water to facilitate the cooling function thereof." Appellants did not dispute this in their response thereto, dated December 11, 2006.

Appellants had an opportunity to challenge this factual assertion in their Response mailed December 11, 2006 or in a response to the Final Office Action, before the filing of the Appeal Brief, but did not. As a result, because Appellants did not traverse the Examiner's assertion of official notice, the Examiner states, on page 9 of the Answer that Appellants argument "is not deemed to be meritorious." In other words, Appellants missed their opportunity to challenge the Examiner's position, and as a result, waived their opportunity to do so in the Appeal Brief.

On the present record, we accept the Examiner's "it is conventional" finding, which is based on the teachings of a prior U.S. patent (and, we expect, on the everyday experience of car drivers with radiator fluid), as admitted prior art.

We are aware of Appellants' discussion regarding the use of oil as a quenchant by Song '774. We are also aware of Appellants' discussion that Song '774 teaches that water is too evaporative. (App. Br. 18-19 and Reply Br. 3-4). However, we are unconvinced that the negative teachings pointed out by Appellants in Song '774 would have led the skilled person to reject such a technique in light of the Examiner's position on this issue. The Examiner's discussion in the paragraph bridging pages 8-9 of the Answer is persuasive in this regard. An examiner will balance the suggestive power of the conflicting prior art, taking into account the degree to which one reference might fairly discredit the other. *Young*, 927 F.2d at 591.

Therefore, we affirm the Examiner's rejection of claims 11 and 23.

E. Claims 26-32[6]

On page 19 of the Brief, Appellants argue that neither reference discloses the feature of formation of a primary eutectic microstructure and a secondary eutectic microstructure.

We find the Specification indicates that this claimed feature is highly dependent on the selection of the compositional alloying elements combined with controlled solidification. *See, e.g.*, paragraphs [30] through [41].

Also, on page 9 of the Answer, the Examiner asserts that the aluminum alloy of Song '739 is "substantially the same" as the claimed composition and that "it would have been obvious to control the cooling rate in the process of Song '739 in view of Song '774 to obtain designated microstructure."

It appears to us that the Examiner is using an inherency argument in an obviousness context, which is a critical flaw in the Examiner's position. That which is inherent in the prior art, if not known at the time of the invention, cannot form a proper basis for rejecting the claimed invention as obvious under § 103. *Shetty*, 566 F.2d at 86. Furthermore, the Examiner has not adequately explained how the claimed microstructure is inherent in the applied art.

In view of the above, we reverse the Examiner's rejection of claims 26-32.

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[6] Appellants argue claims 26-28 and claims 29-32 (Br. 19). We address these claims together because these claims are directed to a primary eutectic microstructure and a second or secondary eutectic microstructure.

II. The Provisional Obviousness-type Double Patenting Rejection of Claims 1-33

As stated by the Examiner on pages 9-10 of the Answer, Appellants did not raise any substantive objections to the provisional rejection under non-statutory obviousness-type double patenting of claims 1-33 in their Brief. On pages 4-5 of the Reply Brief, Appellants explain that they deferred responding to this rejection as it is a provisional rejection. Appellants go on to state that this rejection is improper for the "reasons set forth above".

Because we have affirmed, in part, the rejection over Song '739, and in view of Appellants' failure to raise any substantive objections regarding the patentability of any claims vis-à-vis this rejection, we affirm the provisional obviousness-type double patenting rejection of claims 1-33 in view of Song '893.

CONCLUSIONS OF LAW

1. Appellants have not shown reversible error in the Examiner's rejection because Appellants failed to show that the use of the controlled solidification process taught by Song '774 in the process taught by Song '739 would destroy the intended function of the products made by Song '739. Thus, proper motivation exists in the Examiner's rejection.

2. With regard to claims 26-32, Appellants have shown reversible error in the Examiner's rejection by evincing that the combination of Song '774 in view of Song '739 does not suggest that the controlled solidification of the

alloy forms a primary and second or secondary eutectic microstructure as recited in these claims.

3. Appellants have not shown reversible error in the Examiner's determination that Appellants' claimed invention is obvious over claims 17-25 of Song '893 in view of Song '774 on the ground of nonstatutory obviousness-type double patenting (provisional rejection).

DECISION

I. The rejection of claims 1-25 and 33 under 35 U.S.C. 103(a) over Song '739 in view of Song '774 is affirmed. However, the rejection of claims 26-32 under 35 U.S.C. 103(a) over Song '739 in view of Song '774 is reversed.

II. The provisional rejection of claims 1-33 on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 17-25 of Song '893 in view of Song '774 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv)(2008).

AFFIRMED

tc

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